

## Abstract

This invention relates to the field of materials of the photorefractive crystal. The composition of these crystals is  $\text{Li}_{1-x}\text{Nb}_{1+y}\text{O}_3: \text{Fe}_m, \text{M}_n$ , where M can be magnesium, indium, or zinc; when using q to denote the ion valence of M ( $q=2$  when M is Mg or Zn, and  $q=3$  when M is In), the values of x, y, m, and n are in the range of  $0.05 \leq x \leq 0.13$ ,  $0.00 \leq y \leq 0.01$ ,  $5.0 \times 10^{-5} \leq m \leq 7.5 \times 10^{-4}$ , and  $0.02 \leq qn \leq 0.13$ . This invention greatly improves the photorefractive properties of  $\text{LiNbO}_3$  crystals: makes it have a high diffraction efficiency (more than 68%), a fast response speed for photorefraction (an order of magnitude faster than iron doped  $\text{LiNbO}_3$ ), and a high resistance to optical scattering (the light intensity threshold to photorefractive fan scattering near two orders of magnitude larger than  $\text{LiNbO}_3: \text{Fe}$ ). This invention is an excellent three-dimensional optical storage material and has a vast potential market.